

Presentation of solutions for improving road maintenance management and financing - Case study: Iran

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Abstract

Road maintenance financing is the most important challenges that most of the developing countries are facing with. In these countries, construction- based development of new infrastructure takes more attention than the infrastructure maintenance. Also, road maintenance financing competes with other subsidiary, social and economic sections such as health, training and energy to take sufficient fund. In Iran, road maintenance is less being considered by technical and financial managers, furthermore, it faces to fund shortage, although road network is one of the most important assets in Iran. Based on Assessments done by transportation experts, for financing problems improvement and having a better and acceptable road maintenance system, we should consider several aspects such as: modification of manager's viewpoint, productivity increase in usage of fund, implementation of private sector in road maintenance management, modification of budget disbursement mechanism and creation of road maintenance fund structure. According to this assessment, we prepared a technical report and proposed new methods for road maintenance management and financing.

1. Introduction

On-time and proper road maintenance is of great importance for preservation of national assets and delivery proper services to users. In developing countries, based on lack of sufficient funds and delay in budget allocation for on-time road maintenance, shortage of trained and expert human resources, improper road maintenance planning and programs, roads suffer from bad maintenance and consequently early deterioration. In this situation, road maintenance is costly and need more funds than on-time and perfect road maintenance. These issues have been shown in national road networks operation and delayed road maintenance [1, 2].

Based on some deficiencies in road maintenance and according to international experiences such as ROAD FUNDS, road maintenance concession and human resource training, we analyzed our country's road conditions- road maintenance financing, budget allocation mechanism, road maintenance authority structure, and human resources [3, 4]. Afterwards, we proposed a new structure and also ROAD MAINTENANCE FUND for road maintenance improvement.

2. Road maintenance importance

2.1. Role of transportation in economy

An efficient transportation system is vital for economic development. This system should have a comprehensive network of diverse transportation modes for easy, rapid, safe and efficient access of users (passengers and good producer and distributor) to transportation networks. In each country, transportation network is one of the most important assets and has an important role in economy. In transition and developing countries, road network has more important role than other transportation modes because more than %80 of passengers and freights are transported by road networks.

In Iran, more than %88 of passenger and %85 of freight is carried out by road networks. Furthermore, more than %92 of value added of transportation section belong to road transportation. To have an efficient road networks, road should be maintained suitably and be always in a good conditions. Based on research done by international organizations, road networks with bad conditions will increase the cost of transportation system (for authority and users alike). Also we should consider dissatisfaction of users. They want to travel comfortably, safely and drive fluently [5].

2.2. Importance of on-time road maintenance

When road is maintained on-time and correctly, costs are clear and definite and can be used for budget allocation mechanism. Delay in Road maintenance, because of technical problems or financing issues, can lead to road deterioration acceleration. Consequently, there would be need to rehabilitate or reconstruct of roads. Based on some researches done by several countries and international organizations such as World Bank, there is mounting evidence that in this situation average maintenance cost will increase up to 3 times in comparison to on-time maintenance and its intensity will increase with delay. Road deterioration trend and maintenance related costs in each phase of maintenance are shown in figure 1. This doesn't comprise user costs. Studies show that one dollar road maintenance toll paid by users (tax, fee, vehicle registration and ...), has 2.5 dollars saving in road user costs. It is necessary to mention that proper road maintenance can postpone resurfacing up to 10-15 years; but lack of proper maintenance can lead to severe deterioration at five years. Our researches in Iran justify this point. While we need 2 billion dollars for road maintenance annually, because of delay in road maintenance in last decade, we need more than 7 billion dollars to rehabilitate and reconstruct road networks now. Also, we should add additional road user costs to system.

Based on our studies, international experiences and Iran's road networks conditions, we launched some works and researches to propose a new and comprehensive structure for road maintenance organization and implementation a method to promote road maintenance funds and human resources training.

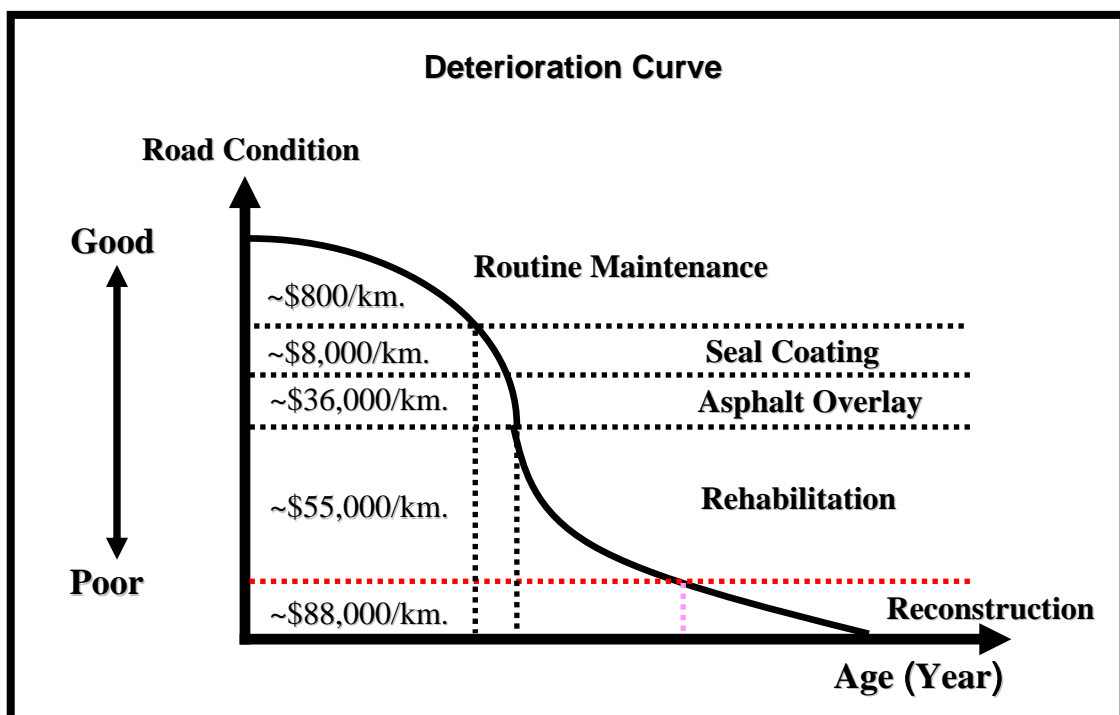


Figure1. Road deterioration trend and road maintenance related cost

2. Road networks assessment

2.1. Road networks length

Iran is a wide country with more than 1.64 million km² areas. Length of road networks is as bellow:

Table1. Total length of inter- urban (rural) road- 2007 [5]

Freeway	Main road (with median)	Main road (without median)	Secondary road	Total*
1429	5468	21788	41129	69814

Note:

- ☒ This is exclude village and urban road and only include inter- urban road that connect cities.
- ☒ Village road connects two villages together or connects villages to inter- urban roads.

This is necessary to mention that inter-urban roads are under responsibility of ministry of road and transportation (MRT) and we discuss this. Urban roads are under responsibility of municipality of city.

In the time of the 4th economic and social development plan (2003-2007), total length of roads had been grown more than %7. We should add roads widening and development. Construction of new freeway network had the maximum growth. But some matters have been neglected from viewpoint of MRT's manager. In the last decades, government has tried to construct and develop new roads. They neglected the needs of management and maintenance of new constructed roads. Furthermore, they did not allocate sufficient budget for road maintenance. Now, we face to high length of deteriorated roads that do not operate sufficiently. Assessments show that new roads do not help to increase the capacity of road networks; because new roads substitute deteriorated roads. This is one of the most important challenging features that we seek to change viewpoint of managers to allocate budget to road maintenance.

2.2. Road networks operation

Road networks carry most of passenger and freight (about %85). Based on 2007 statistics, more than 794.5 Million passengers and 485 million ton freights had been carried by road networks, figure 1 & 2.

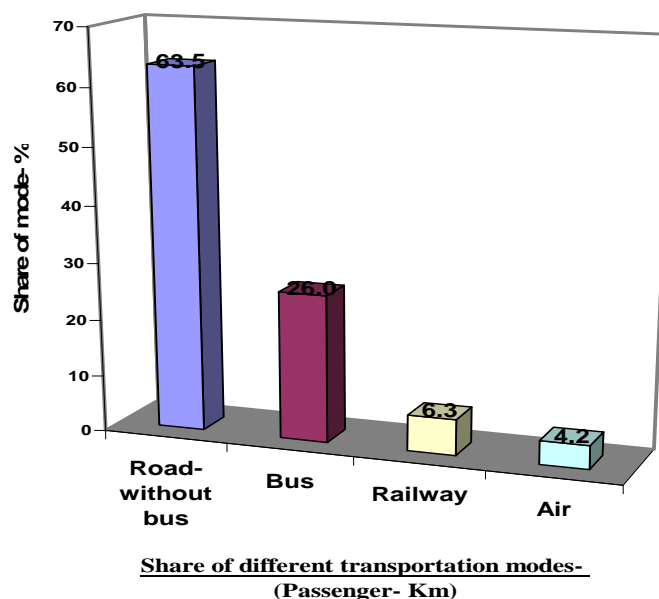
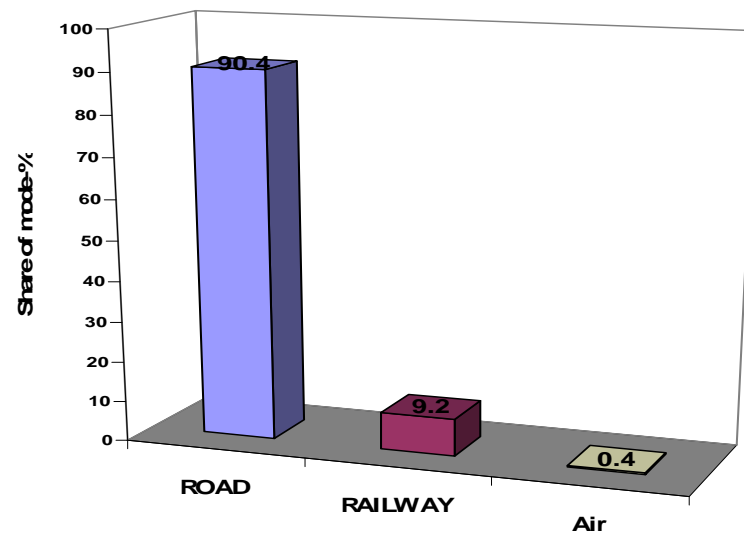


Figure1. Share of different transportation mode (passenger- km)- 2007



Share of different mode of transportation(Ton-km)

Figure2. Share of different transportation mode (freight ton- km)- 2007

3. Road maintenance authority organization structure

Road maintenance is under responsibility of Road Maintenance and Transportation Organization (RMTO). This organization is one of the dependent deputies of Iran's ministry of Road and Transportation (MRT). RMTO collects fund from different sources, plan and program road maintenance activities, allocates fund to projects and oversees and manages all of mentioned works. RMTO has two main bodies: state department and local agency (province offices). National roads are under direct responsibility of state department and main and secondary roads are under responsibility of local body (in each province). MRT and RMTO's organization structure is shown in figure 2.

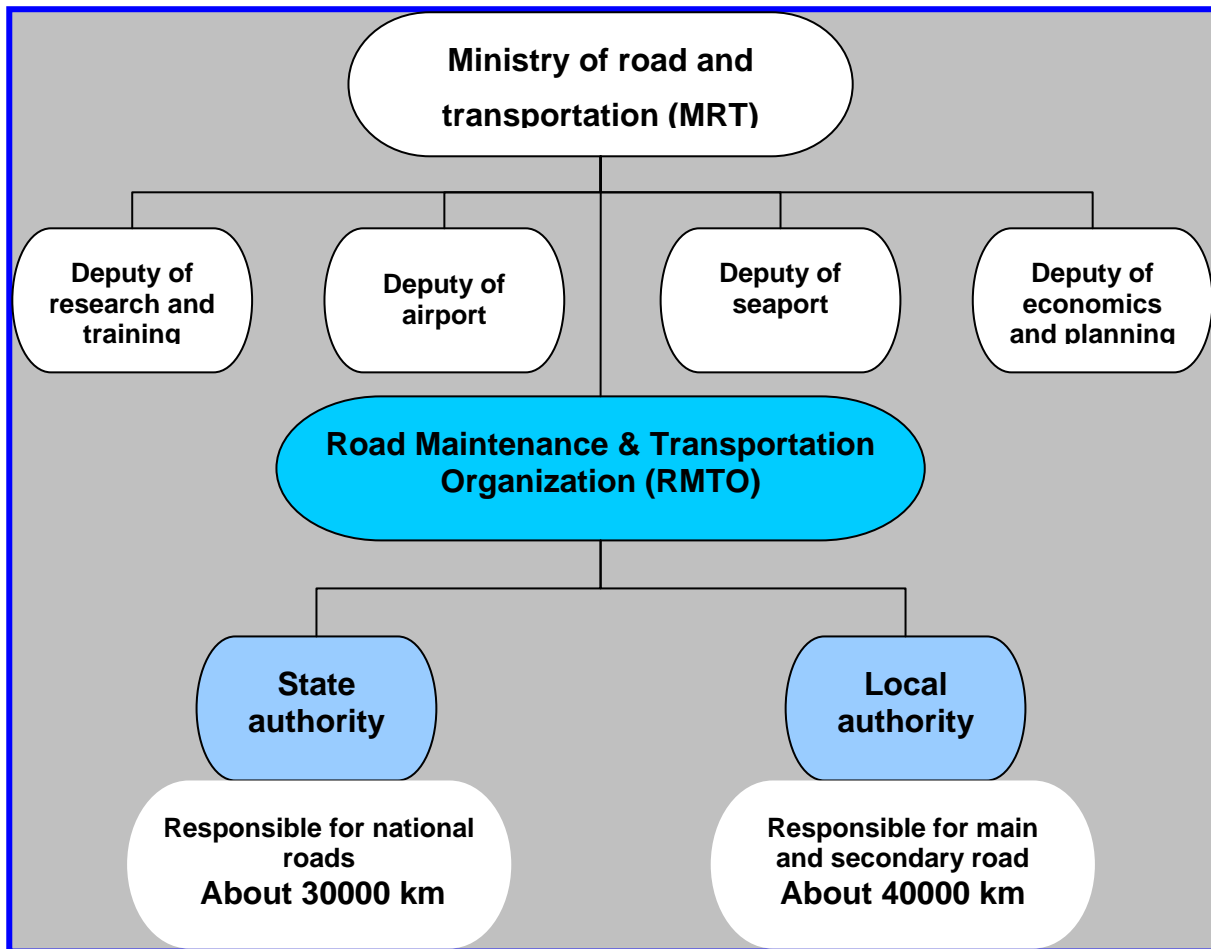


Figure3. Iran MRT's organization structure

Road authority organization structure in provinces is shown in figure 4. The main responsibility of this authority is road maintenance.

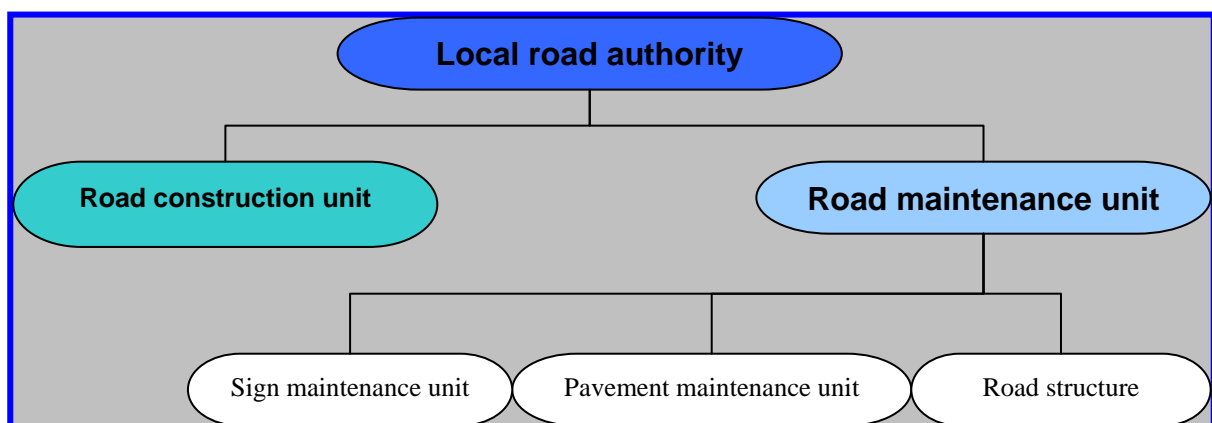


Figure4. Road authority organization structure

4. Road maintenance projects financing

Transportation infrastructure development and maintenance financing rely on annual central government public budget. As mentioned in previous sections, MRT should haggle to absorb fund,

while economic managers pay less attention to transportation, especially maintenance. Road maintenance is financed via three basic fund sources, as follows, figure 5:

1. **Tolls freeways**. As it was shown at table 1, there are 1430 km freeways that are financed and managed by private sector via tolls. These lengths are about %2.05 of total inter- urban road networks.
2. **Public budget** allocated to state and local authority has the most important role in road maintenance financing. It is about %75 of total funds that is allocated to road maintenance.
3. **Financing based on RMTO's income**. Based on RMTO's responsibility and operation, RMTO has income. This organization allocates some of its income to road maintenance. It is about %18 of total road maintenance fund.

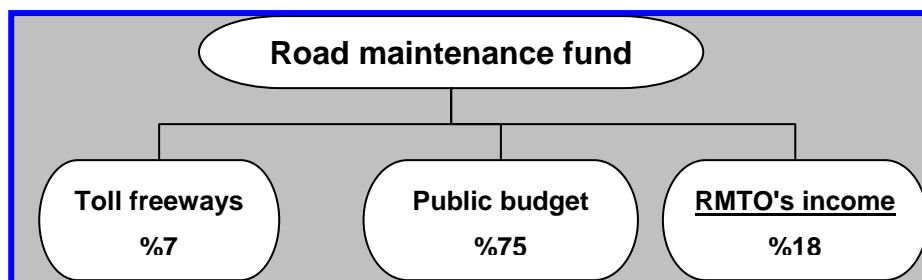


Figure 5: road maintenance fund [5]

Based on economic growth, it is predicted that the amount of freight and number of passenger will increase in recent 10 years. This is important to note that growth of freight and passenger transportation is higher than economic growth. Transportation experts say, most of this increase, goes on road networks.

5. Challenges in front of road maintenance

5.1. Road maintenance related problems

Based on data assessment and field experiences done by experts - organization structure, road maintenance authority, human resource and financing- problems are divided as follows:

1. Funds problems
2. Human resource problems
3. Technical restrictions for implementation of PMS
4. Road maintenance contracting and concession to contractor

While we had good progress in road maintenance, now more than %80 of maintenance works are done by private contractors, but insufficient road maintenance funds is the most important problems that threat effective road maintenance.

5.1.1. Road maintenance financing related problems

The first problem in road maintenance is insufficient funds. These problems affect related activity based on some reasons as follows:

- a) Iran is a developing country. Subsidize is common and people do not pay tax for transportation services. Consequently, public budget is limit and government usually faces budget shortage for allocation to service sectors such as training, health, energy and transportation. Afterwards, local and state government and managers usually do not pay sufficient attention to transportation, specifically road maintenance. They think investment in

road maintenance is exhaustion of capital. They want to construct more than to maintenance and management.

- b) Road maintenance authority should compete with other sectors such as training and health to absorb funds; but in developing and low income countries, infrastructure is out of order. In Iran, we face to some managers that do not believe maintenance.

Statistics show that:

1. Iran's road assets value is about 70 billion dollars.
If we consider that the average annual budget needs to maintenance is %3 of assets value, we need 2.1 billion dollars to maintain road networks annually.
2. Fund allocating annually is about 1.5 billion dollars. So we face to 600 million dollars shortage for proper road maintenance.
3. Based on RMTO experience, RMTO needs more than 7 billion dollars to rehabilitate and reconstruct road networks been deteriorated based on delayed maintenance.

5.1.2. Human resource related problems

As we know, good trained expert is essential to implement and execute road maintenance plan. Based on done assessment, RMTO suffer from lack of human trained resources. This is more severe in local road authority in province. While Deputy of research and training and RMTO are planning to implement pavement management system in road authority, lack of road maintenance trained expert is the most important barrier for this policy.

5.1.3. Technical restrictions for implementation of PMS

The main feature to implement PMS is technical knowledge. Also a comprehensive data base and trained experts that are familiar with PMS are needed. In local road authority, we have deficiency in all mentioned features. Experts do road maintenance activity traditionally. PMS hasn't been trained to them. There is no a comprehensive time serious of road conditions.

5.1.4. Road maintenance contracting and concession to contractor

Road maintenance concession is based on lump- sum method. The road authority define project based on the road network conditions, for example patching, cracking, roadside maintenance, rehabilitation, and so on. Then, road agency selects the contractor based on bidding producer and considers price of bid and technical ability of contractor. In this method, contractor doesn't have flexibility to handle new method and creativity in its works. Payment is based on the amount of work done by contractor, not based on the quality of work, because the inventory system isn't comprehensive and there aren't road quality assessment indexes. Beside these problems, as mentioned in later paragraph, road maintenance experts aren't familiar with road maintenance system.

6. Recommendation

As mentioned in previous sections, we face to two road maintenance main related problems. First, we should try to increase road maintenance annual budget to better road maintenance, second we should try to maintenance road network based on road management system.

6.1. "ROAD FUND" as a best solution.

After assessment of road maintenance financing in Iran, we studied international experience. We finally draw conclusions as follows:

- a) First of all, we need to increase road maintenance funds.
- b) We should try to change our politician's viewpoints related to road maintenance.
- c) Propose to allocate fuel tax income to road maintenance.
- d) Concession road maintenance activity to private sector for productivity increase
- e) Management of road maintenance fund based on independent structure.

Our solutions to "Technique optimization of road maintenance management in Iran" are as follows:

1. Creation of "ROAD FUND" based on Iran's internal conditions.
2. For this, we suggested a "ROAD FUND" structure that is under approval of "Supreme council of transportation (SCT)".
3. Alteration and correction of tax laws to allocate more funds to road maintenance. According to the 4th development plan, oil productions (Fuel) price will grow to world price. We suggest allocating more funds based on increase of tax on fuel.
4. Another important parameter is to change political viewpoint about road maintenance problems. For this, we arranged a meeting and decide to invite people from different economic and financial organizations and explain problems related to road maintenance.

6.2. Proposal to change road maintenance unit organization structure in road maintenance authority in local road authority

While the road maintenance main problem is lack of sufficient budget, lack of human resource and deficiency in road maintenance authority can not be neglected. Based on assessment done by experts, we should change our view point and see road infrastructure as an important asset built by huge amount of capital and human resource. For this, we proposed a new road maintenance unit organization structure consisting of asset management unit in local road authority, figure 6. This new view of road networks is an assistant to better management of road maintenance and also better management of "ROAD FUND".

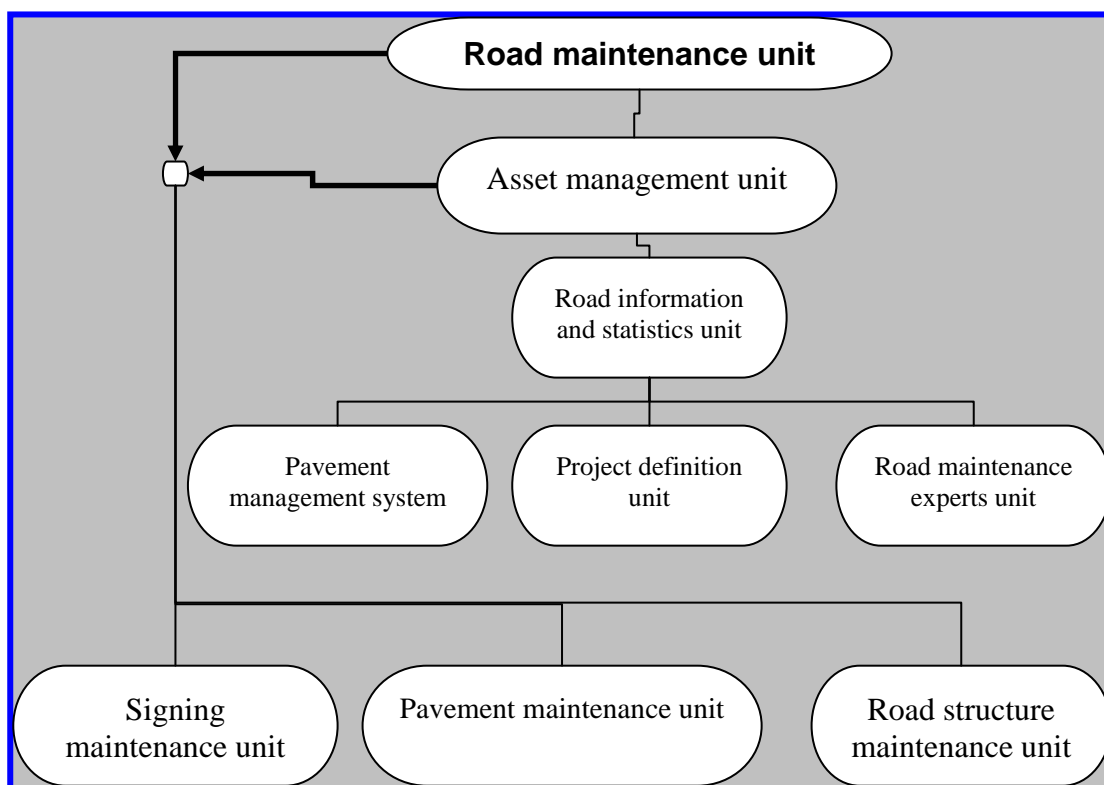


Figure 6: new road maintenance unit organization structure

7. Conclusion

This paper has been prepared based on a technical report approved in Iran's ministry of road and transportation, deputy of research, training and technology. In this report, we assessed road networks operation, road network conditions, road maintenance financing, and road maintenance unit organization structure. Then, we analyzed problems that we face to have a better maintained road. We observed that lack of sufficient fund, improper management of road maintenance budget, lack of trained expert human resources and lack of a statistical unit in road authority have an adverse effect on proper road maintenance. Based on our observation, we proposed three main solutions to improve road maintenance and road network conditions.

First: for better management of road maintenance fund, we should create "ROAD FUND".

Second: based on 4th economic development plan, we should increase tax on fuel and allocate %60 of tax income to road maintenance.

Finally: we proposed a new road maintenance organization structure in road authority to better implementation of road management system. In this structure, we create an asset management unit in road authority.

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